Section 404 / NEPA Interagency Merger Process Concurrence Meeting

Concurrence Points 2 (Revisited) and 2A

Detailed Study Alternatives

and

Bridging Decisions and Alignment Review

US 70, West of T.W. Alexander Drive to East of I-540

NCDOT Division 5 – Wake & Durham County

NCDOT STIP Project No. U-5518

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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1. Introduction

This packet includes information for the *National Environmental Policy Act of 1969* (NEPA)/Section 404 Merger Team to reach concurrence on Concurrence Point (CP) 2 Revisited and CP 2A. Design revisions were made to Alternative 2 based on feedback from local stakeholders and are being added as Alternative 2 Revised.

2. Project Description

A planning, environmental, and engineering study is being conducted for improvements to US 70 (Glenwood Avenue) from west of T.W. Alexander Drive (State Route [SR] 3067) to east of I-540 (State Transportation Improvement Program (STIP) Project U-5518) in accordance with NEPA, as amended. The proposed project is anticipated to include interchanges and/or grade-separations at T.W. Alexander Drive and at Brier Creek Parkway (SR 3100/SR 3109) and to include corridor upgrade of US 70 from west of T.W. Alexander Drive (SR 3067 to I-540. US 70 provides access to the residential communities, businesses, and shopping centers located in the Brier Creek area. In addition, US 70 is classified as a principal arterial and serves as a regional east-west route between Raleigh and Durham, and provides access from Raleigh and Durham to Raleigh-Durham International Airport (RDU) and Research Triangle Park (RTP) via I-540. **Figure 1** illustrates the project location and study area.

The proposed project is included in the 2018-2027 North Carolina Department of Transportation (NCDOT) STIP as Project No. U-5518. The project is divided into the following three sections:

- Section A: Corridor upgrade of US 70 from west of T.W. Alexander Drive (SR 3067) to I-540
- Section B: Upgrade US 70/T.W. Alexander Drive (SR 3067) to an interchange
- Section C: Upgrade US 70/ Brier Creek Parkway (SR 3100/SR 3109) to an interchange

The programmed project schedule is shown in **Table 1**.

Table 1: Project schedule

Section	Right-of-way	Construction
U-5518A	FY 2019	FY 2019
U-5518B	FY 2019	FY 2019
U-5518C	FY 2019	FY 2019

3. Previous Merger Meetings

On March 20, 2016, the NEPA/Section 404 Merger Team reached concurrence on CP 1, Purpose and Need and Study Area Defined. The needs to be addressed by the proposed action include the following:

- Increasing traffic volumes
- Poor levels of service
- Excessive queue lengths and travel delays
- Higher than average crash numbers

The purpose of the proposed project is to improve traffic flow and operations on US 70 (Glenwood Avenue), and associated intersections and/or interchanges, from west of T.W. Alexander Drive (SR 3067) to east of I-540, by reducing anticipated travel delays and queue lengths as compared to those anticipated in the future no-build condition.

At the same merger team meeting, the agencies agreed to carry the following design options forward for detailed study (CP 2):

- Section A (US 70 Corridor Upgrade):
  - Freeway design: Full control of access
  - Expressway design: Limited or partial control of access

- Section B (US 70/ T.W. Alexander Drive (SR 3067) interchange:
  - Upgrade-existing alternative: Interchange at existing location
  - New location alternative: Interchange at future Aviation Parkway Extension and grade separation at existing location

- Section C (US 70 / Brier Creek Parkway (SR 3100/ SR 3109 interchange):
  - Upgrade-existing alternative: Interchange at existing location

4. Project Study Area

The proposed project is located in a rapidly growing area of northwestern Wake County and southeastern Durham County within the City of Raleigh and the City of Durham's municipal boundaries. The project study area is heavily developed with high concentrations of commercial and residential properties, along with scattered office and industrial properties. The area has seen notable population growth over the past decade due to its proximity to the Brier Creek Country Club, adjacent residential areas, shopping centers, and RTP.

The project study area stretches from the US 70 and Lumley Road (SR 1645)/ Westgate Road (SR 1837) interchange on the southeast end to just west of the US 70 (Glenwood Avenue)/SR 3067 (T.W. Alexander Drive) intersection near the Durham County/Wake County lines, and includes commercial development and a large cemetery. It is bounded on the north by the US 70 and Page Road Extension (SR 2095) intersection, on the east by commercial and residential development along the US 70 corridor, on the south by William B. Umstead State Park and RDU, and to the west by the Brier Creek Country Club and a high concentration of residential development.

5. Summary of Alternatives Recommended for Detailed Study

Three alternatives are being recommended for detailed study: Alternative 1 and Alternative 2, which were both presented to the public in April 2017, and Alternative 2 Revised. Alternative 2 Revised was developed after the April 2017 public meeting based upon feedback from the public and updated traffic analyses. A description of each alternative is below and shown on **Figure 2**.

5.1. Alternative 1

This alternative would replace U.S. 70s existing at-grade intersections at T.W. Alexander Drive and at Brier Creek Parkway, with new interchanges in the existing locations. This alternative would construct a Single-Point Urban Interchange (SPUI) at Brier Creek Parkway and a limited access directional interchange at T.W. Alexander Drive.

In addition, this Alternative would require the use of braided ramps between the two new interchanges due to the short distance between them. Braided ramps occur when one highway on or off ramp crosses over another on or off ramp to that highway.

5.2. Alternative 2

This alternative was developed to eliminate the need for braided ramps between the two new interchanges. Like Alternative 1, this alternative would also construct a SPUI at Brier Creek Parkway. However, to create additional space between the interchanges, Alternative 2 would construct a new interchange west of the existing U.S. 70 and T.W. Alexander Drive intersection and provide a new connection from T.W. Alexander Drive to U.S. 70. The existing T.W. Alexander Drive intersection with U.S. 70 would then be grade separated (T.W Alexander bridging over U.S. 70) with no access to or from U.S. 70.

5.3. Alternative 2 Revised

Alternative 2 Revised was developed to provide additional access to T.W. Alexander Drive. As in Alternative 2, a SPUI would be constructed at Brier Creek Parkway and a new interchange would be constructed west of the existing US 70 and T.W. Alexander Drive intersection. In Alternative 2 Revised a ramp would be added from eastbound US 70 to the existing T.W. Alexander Drive and a loop would be added from southbound T.W. Alexander to eastbound US 70. Corners Parkway would be utilized as a quadrant roadway and right in/right out access would be provided with necessary deceleration and acceleration lanes on US 70.

It was determined this alternative would reduce some of the complexity shown in the other two alternatives, especially with regard to the amount of signing and access changes from US 70 to T.W. Alexander Drive. The ramp and loop connecting US 70 and T.W. Alexander Drive would provide increased connectivity and mobility to the developments around T.W Alexander, as well as reduce traffic and congestion at the US 70 interchange with Brier Creek Parkway. Alternative 2 Revised reduces the severity of weaving traffic along US 70 between Aviation Parkway Extension and Brier Creek Parkway.

6. Traffic Analysis Update

The level of service (LOS) summary for each intersection in a.m. and p.m. peak periods in the year 2040 for each alternative are presented in **Table 2**.

Table 2: LOS summary

Intersection	Alternative 1				Alternative 2				Alternative 2 Revised			
	a.m.		p.m.		a.m.		p.m.		a.m.		p.m.	
	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)
Brier Creek Pkwy at US 70 (Glenwood Ave) SPUI	D	40.7	D	53.7	D	41.9	D	41.7	C	33.5	D	38.4
T.W. Alexander Drive at Little Brier Creek Lane	E	73.2	C	32.5	A	9.0	C	23.1	C	29.7	C	29.0
T.W. Alexander Drive at ACC Boulevard	C	25.6	D	53.4	C	29.7	C	29.7	C	23.7	C	27.9
Brier Creek Pkwy. at ACC Boulevard	F	93.8	E	68.0	F	116.9	F	100.3	E	58.4	E	56.6
Brier Creek Parkway at Skyland Ridge Parkway	C	22.1	C	21.3	B	18.8	B	17.3	B	11.0	B	10.4
T.W. Alexander Drive at Aviation Parkway Extension	N/A	N/A	N/A	N/A	C	24.4	D	35.0	C	33.5	C	24.7
T.W. Alexander Drive at Corners Parkway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	28.4	C	22.9

The LOS summary shows that, in general, the LOS for Alternative 2 Revised is better than the other two alternatives and the resulting delay is shorter. The improvements between Alternative 2 Revised and the other two alternatives can be attributed to the distribution of traffic interacting with US 70 to additional access points, rather than consolidating traffic to few access locations between US 70 and the crossing streets. A more detailed description of the differences in the three alternatives is shown in Tables 3 through 6 below which indicate the differences in LOS, Volume/Capacity ratio (V/C ratio), and queue length for the intersections (**Table 3**), basic freeway segments (**Table 4**), ramps and ramp junctions (**Table 5**), and freeway weaving segments (**Table 6**).

Table 3: Intersection Comparison

Intersection	Alternative 1 LOS (v/c Ratio) [Queue]	Alternative 2 LOS (v/c Ratio) [Queue]	Alternative 2 Revised LOS (v/c Ratio) [Queue]
Little Brier Creek Ln at TW Alexander Dr	E (1.27) [758]	F* (1.01) [284]	C (0.89) [363]
TW Alexander Dr at ACC Blvd	F* (1.08) [639]	C (0.87) [469]	C (0.89) [435]
Brier Creek Pkwy at ACC Blvd	F (1.29) [960]	F (1.40) [1,263]	F* (1.09) [1,057]
Brier Creek Pkwy at Skyland Ridge Pkwy	C (0.92) [1,012]	B (0.79) [993]	B (0.80) [1,013]
TW Alexander Dr at Aviation Pkwy Ext.	-	F* (1.00) [553]	C (0.89) [554]
TW Alexander Dr at Corners Pkwy	-	-	C (0.88) [363]
Sporting Club Dr at TW Alexander Dr	A (0.79) [231]	-	-
Brier Creek Pkwy at US 70 (Glenwood Ave) SPUI	F* (1.06) [1,560]	F* (1.05) [986]	D (0.96) [984]

*LOS is F due to v/c > 1.00
Note: Worst of the three alternatives in red

Table 4: Basic Freeway Segments Comparison

Basic Freeway Segment	Alternative 1 LOS (Density)	Alternative 2 LOS (Density)	Alternative 2 Revised LOS (Density)
EB US 70 (Glenwood Ave) within TW Alexander Dr Int.	C (21.5)	-	-
EB US 70 (Glenwood Ave) within Braided Ramp	B (11.9)	-	-
WB US 70 (Glenwood Ave) within Braided Ramp	B (12.8)	-	-
EB US 70 (Glenwood Ave) within Brier Creek Pkwy Int.	C (25.6)	C (22.5)	-
EB US 70 (Glenwood Ave) West of Aviation Pkwy Ext.	-	D (27.9)	D (26.3)
WB US 70 (Glenwood Ave) West of Aviation Pkwy Ext.	-	D (27.9)	D (26.3)
EB US 70 (Glenwood Ave) within Aviation Pkwy Ext. Int.	-	D (29.1)	C (21.7)
WB US 70 (Glenwood Ave) within Aviation Pkwy Ext. Int.	-	D (29.1)	C (19.5)
EB US 70 (Glenwood Ave) from Aviation Pkwy Ext. to Brier Creek Pkwy	-	C (25.5)	-
WB US 70 (Glenwood Ave) from Brier Creek Pkwy to Aviation Pkwy Ext.	-	E (36.2)	-
WB US 70 (Glenwood Ave) within Brier Creek Pkwy Int.	-	C (22.5)	-
WB US 70 (Glenwood Ave) from Corners Pkwy to Aviation Pkwy Ext.	-	-	C (24.2)
EB US 70 (Glenwood Ave) within TW Alexander Dr Int.	-	-	C (22.8)
WB US 70 (Glenwood Ave) from Brier Creek Pkwy to Corners Pkwy	-	-	D (26.4)

Note: Worst of the three alternatives in red

Table 5: Ramps and Ramp Junctions Comparison

Ramp / Ramp Junction	Alternative 1 LOS or v/c Ratio (Density)	Alternative 1 LOS or v/c Ratio (Density)	Alternative 2 Revised LOS or v/c Ratio (Density)
EB US 70 (Glenwood Ave) to WB TW Alexander Dr	C (21.8)	-	-
WB TW Alexander Dr from WB US 70 (Glenwood Ave)	0.69	-	-
EB TW Alexander Dr to EB US 70 (Glenwood Ave)	0.55	-	-
EB US 70 (Glenwood Ave) to Brier Creek Pkwy	B (12.4)	0.67	-
WB US 70 (Glenwood Ave) from Brier Creek Pkwy	0.44	-	-
EB US 70 (Glenwood Ave) from EB TW Alexander Dr	C (22.6)	-	-
WB US 70 (Glenwood Ave) to WB TW Alexander Dr	-	0.55	-
EB US 70 (Glenwood Ave) to SB Aviation Pkwy Ext.	-	0.44	0.57
SB Aviation Pkwy Ext. from EB US 70 (Glenwood Ave)	-	0.36	0.33
NB Aviation Pkwy Ext. to EB US 70 (Glenwood Ave)	-	0.75	0.46
WB US 70 (Glenwood Ave) from NB Aviation Pkwy Ext.	-	0.85	C (21.5)
EB US 70 (Glenwood Ave) from NB Aviation Pkwy Ext.	-	0.67	-
WB US 70 (Glenwood Ave) to SB Aviation Pkwy Ext.	-	0.55	0.63
WB US 70 (Glenwood Ave) to Brier Creek Pkwy	-	0.67	-
WB US 70 (Glenwood Ave) from Corners Pkwy	-	-	B (19.9)
WB US 70 (Glenwood Ave) to Corners Pkwy	-	-	C (27.1)
WB US 70 (Glenwood Ave) from Brier Creek Pkwy	-	-	0.69

Note: Worst of the three alternatives in red

Table 6: Freeway Weaving Segments Comparison

Freeway Weaving Segment	Alternative 1 LOS (v/c Ratio) [Density]	Alternative 1 LOS (v/c Ratio) [Density]	Alternative 2 Revised LOS (v/c Ratio) [Density]
EB US 70 (Glenwood Ave) from Aviation Pkwy Ext. to TW Alexander Dr	-	-	C (0.699) [30.4]
WB US 70 (Glenwood Ave) from TW Alexander Dr to Aviation Pkwy Ext.	-	-	E (0.751) [41.5]
EB US 70 (Glenwood Ave) from Aviation Pkwy Ext. to Brier Creek Pkwy	-	D (0.695) [30.4]	-
WB US 70 (Glenwood Ave) from Brier Creek Pkwy to Aviation Pkwy Ext.	-	D (0.695) [30.4]	-
EB US 70 (Glenwood Ave) from TW Alexander Dr to Brier Creek Pkwy	-	-	C (0.592) [25.1]
WB US 70 (Glenwood Ave) from Brier Creek Pkwy to TW Alexander Dr	-	-	E (0.98) [38.2]
EB US 70 (Glenwood Ave) from Brier Creek Pkwy to I-540	F (1.475)	D (0.960) [32.4]	F (1.011)
WB US 70 (Glenwood Ave) from I-540 to Brier Creek Pkwy	F (1.497)	D (0.960) [31.7]	F (1.011)

Note: Worst of the three alternatives in red

Based on the information presented in the traffic analysis, a comparison summary of the three alternatives is below.

ALTERNATIVE 1

Advantages:

- Freeway elements west of Brier Creek Pkwy operate the best of all three alternatives

Disadvantages:

- LOS F in both peak hours with v/c ratios greater than 1.20 for weaving sections along US 70 (Glenwood Ave) between Brier Creek Pkwy and I-540
- LOS F in AM peak hour for Intersection of Brier Creek Pkwy and ACC Blvd
- LOS C in both peak hours for the intersection of Brier Creek Pkwy and Skyland Ridge Pkwy, worse than Alternative 2 and Alternative 2 Rev
- LOS F in the PM peak hour for the intersection of TW Alexander Drive at ACC Blvd
- LOS E in the AM peak hour for the intersection of TW Alexander Drive at Little Brier Creek Ln
- Construction of additional flyovers and lanes at TW Alexander Drive interchange
- Lengthy queues for right turns at the WB US 70 (Glenwood Ave) off-ramp during the PM
- Peak hour (1,560'), possibly exceeding the length of the ramp

Alternative 2

Advantages:

- LOS D for weaving section between Brier Creek Pkwy and I-540, better than Alternative 1
- and Alternative 2 Rev
- LOS A in the AM peak hour for the intersection of TW Alexander Dr at Little Brier Creek Ln, better than Alternative 1 and Alternative 2 Rev

Disadvantages:

- LOS F during both peak hours and queues in excess of 1,000' at the intersection of Brier Creek Pkwy at ACC Blvd
- LOS E in the AM peak hour for the freeway segment between Brier Creek Pkwy and Aviation Pkwy Ext.
- Indirect routing – traffic must use Brier Creek Pkwy and Aviation Pkwy Ext. in place of TW Alexander Drive, resulting in much longer travel times for some traffic

Alternative 2 Revised

Advantages:

- Best operations for all alternatives at the intersection of Brier Creek Pkwy and ACC Blvd, queues much less than Alternative 2
- US 70 (Glenwood Ave) at Brier Creek Parkway (SPUI) operates at LOS C during the AM peak hour, better than LOS D in Alternative 1 and Alternative 2
- Less turning storage required along ACC Blvd and Brier Creek Pkwy than in Alternative 2
- Overall better operations for most freeway and ramp movements at the Aviation Pkwy Ext. interchange compared with Alternative 2

Disadvantages:

- LOS F during the AM peak hour (WB) and PM peak hour (EB) for the weaving section between Brier Creek Pkwy and I-540. v/c ratio of 1.011 indicates that this weave would be under capacity until just before 2040
- Auxiliary lanes required on EB US 70 (Glenwood Ave) between Aviation Pkwy Ext. and TW Alexander Drive, and again between TW Alexander Drive and Brier Creek Pkwy

7. Environmental Features

The notable features and wetland and stream delineations for the proposed project alternatives are presented in **Figure 3.**

Environmental features within or adjacent to the project study area described as follows:

- The project study area is located on the edge of the Neuse River Basin and is subject to riparian buffer protection program rules (15A NCAC 02 .0233). Neuse River Basin buffer rules state that a 50-foot wide riparian buffer (Zone 1: 30 feet and Zone 2: 20 feet) should be implemented directly adjacent to surface waters within the basin.
- Brier Creek, Little Brier Creek and Sycamore Creek are named streams that flow through the study area, although there are additional unnamed tributaries within the project area. Brier Creek and Little Brier Creek are both listed on the NC Division of Water Resources 2014 Final 303(d) list as impaired due to PCB contamination. Little Brier Creek has a Federal Emergency Management Agency (FEMA) designated floodway, with 100-year and 500-year floodplains identified.
- Sycamore Creek is located near the east boundary of the study area and has a FEMA designated floodway with 100-year and 500-year floodplains identified.
- The project area is not located in critical areas of a water supply/watershed district.
- Wetland and streams were delineated within a natural resources survey area.

8. Wetlands, Streams and Ponds

Named streams within the study corridors include Little Brier Creek and Sycamore Creek. These streams are considered jurisdictional surface waters under Section 404 of the Clean Water Act. Unnamed tributaries to these streams and unnamed tributaries to Lick Creek were also located within the project corridor and are considered jurisdictional surface waters under Section 404 of the Clean Water Act.

The project lies within the Neuse River basin. There are no designated High Quality Waters, Outstanding Resource Waters, or water supply watersheds (WS-I or WS-II) within one mile downstream of the study area. Characteristics of the jurisdictional streams within the project study area are included in **Table 7**. Characteristics of jurisdictional wetlands within the project study area are provided in **Table 8**.

NCDOT completed an addendum to the original Natural Resources Technical Report (NRTR) (completed in August 2014) in July of 2016. Information related to the original study area/project was taken from the NRTR (completed by HDR, Inc.). Fieldwork for the NRTR Addendum was conducted between December 7, 2015 and June 22, 2016. Jurisdictional areas identified in the original study area were verified by Eric Alsmeyer of the US Army Corps of Engineers (USACE) on June 20 and July 31, 2014. A Jurisdictional Determination verification site visit with the USACE and the North Carolina Division of Water Resources (NCDWR) was held in April 2018 for resources within the addendum study area.

Table 7: Characteristics of Jurisdictional Streams

Map ID	Stream Name	NCDWR Index Number	Best Usage Classification	Bank Height (ft.)	Channel Width (ft.)	Water Depth (in.)	Channel Substrate	Flow	Clarity	Map ID	Total Length in Entire Study Area (ft.)	Classification	USACE Compensatory Mitigation Required	River Basin Buffer
SA	Unnamed Tributary (UT) to Little Brier Creek	27-33-4-1	C NSW	1 - 3	2 - 4	6 - 12	Silt, Sand, Gravel	Slow	Slightly turbid	SA	955	Perennial	Yes	Subject
SC	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 4	1 - 4	4 - 18	Silt, Sand, Gravel	Moderate	Clear	SC	3,638	Perennial	Yes	Subject
SD	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 4	1 - 2	1 - 4	Silt, Sand, Gravel, Cobble	Moderate	Clear	SD	804	Intermittent	No	Subject
SE	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 4	2 - 5	6 - 24	Silt, Sand, Gravel, Cobble	Moderate	Clear	SE	748	Perennial	Yes	Subject
SF	UT to Little Brier Creek	27-33-4-1	C NSW	1.5 - 6	4	6 - 12	Sand, Gravel	Slow	Clear	SF	515	Perennial	Yes	Subject
SI	UT to Little Brier Creek	27-33-4-1	C NSW	0.5 - 6	2 - 3	1 - 8	Silt, Sand, Gravel	Moderate	Clear	SI[1]	669	Intermittent	No	Subject
SJ	Little Brier Creek	27-33-4-1	C NSW	3 - 10	6 - 10	12 - 24	Silt, Sand, Gravel	Moderate	Slightly turbid	SJ	5,363	Perennial	Yes	Subject
SK	UT to Little Brier Creek	27-33-4-1	C NSW	6 - 8	2 - 4	2 - 12	Silt, Sand, Gravel, Cobble	Moderate	Clear	SK	163	Intermittent	No	Subject
SL	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 3	2 - 8	1 - 12	Silt, Sand	Slow	Clear	SL	751	Intermittent	No	Not Subject
SM	UT to Little Brier Creek	27-33-4-1	C NSW	2 - 7	2 - 3	1 - 12	Silt, Sand, Gravel	Moderate	Slightly turbid	SM	146	Intermittent	No	Not Subject
SN/SZZJ	UT to Little Brier Creek	27-33-4-1	C NSW	8	10	6 - 24	Sand, Gravel	Slow	Slightly turbid	SN/SZZJ	753	Intermittent	Undetermined	Subject
SN/SZZJ	UT to Little Brier Creek	27-33-4-1	C NSW	0.5	2	0.5 - 2	Silt, Sand	Moderate	Clear	SN/SZZJ	3,219	Perennial	Yes[2]	
SO	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 2	1 - 2	4 - 6	Sand, Gravel	Moderate	Clear	SO	179	Intermittent	No	Not Subject
SP	UT to Little Brier Creek	27-33-4-1	C NSW	6 - 8	3 - 6	1 - 8	Silt, Sand, Gravel	Moderate	Slightly turbid	SP	117	Intermittent	No	Not Subject
SQ	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 6	1 - 3	1 - 6	Silt, Sand, Gravel	Moderate	Clear	SQ	149	Intermittent	No	Subject
SS	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 4	1 - 2	2 - 4	Silt, Sand	Slow	Slightly turbid	SS	115	Intermittent	No	Subject
ST	UT to Little Brier Creek	27-33-4-1	C NSW	.05 - 1	2 - 3	1 - 3	Sand	Slow	Clear	ST	285	Intermittent	No	Not Subject
SU	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 2	1 - 3	2 - 6	Silt, Sand, Gravel	Moderate	Clear	SU	1,686	Perennial	Yes	Subject
SV	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 3	1 - 2	1 - 6	Silt, Sand, Gravel	Slow	Slightly turbid	SV	107	Intermittent	No	Not Subject
SW	UT to Little Brier Creek	27-33-4-1	C NSW	4 - 6	10 - 12	3 - 36	Sand, Gravel, Cobble	Moderate	Slightly turbid	SW	3,949	Perennial	Yes	Subject
SY	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 2	2 - 3	6 - 12	Silt, Sand, Gravel	Moderate	Clear	SY[3]	1,493	Perennial	Yes[3]	Subject
SAA	UT to Little Brier Creek	27-33-4-1	C NSW	0.5 - 1	1 - 2	4 - 8	Silt, Sand, Gravel, Cobble	Slow	Clear	SAA	437	Intermittent	No	Subject
SDD	UT to Sycamore Creek	27-33-9	B NSW	1	2	1 - 6	Sand, Gravel	Slow	Clear	SDD	179	Intermittent	No	Subject
SEE	UT to Sycamore Creek	27-33-9	B NSW	2	2	1 - 4	Sand, Gravel	Slow	Clear	SEE	849	Intermittent	No	Subject
SFF	UT to Sycamore Creek	27-33-9	B NSW	5 - 8	5	6 - 24	Silt, Sand	Slow	Slightly turbid	SFF	968	Intermittent	No	Subject
SGG	Sycamore Creek	27-33-9	B NSW	5 - 10	12 - 20	1 - 4	Silt, Sand, Gravel, Cobble	Moderate	Clear	SGG	2,947	Perennial	Yes	Subject
SII	UT to Sycamore Creek	27-33-9	B NSW	0.5 - 1	1 - 2	2 - 6	Silt, Sand	Slow	Slightly turbid	SII	282	Intermittent	No	Subject
SJJ	UT to Little Brier Creek	27-33-4-1	C NSW	1 -2	2 - 4	6 - 12	Silt, Sand	Slow	Slightly turbid	SJJ	27	Intermittent	No	Subject
SKK	UT to Sycamore Creek	27-33-9	B NSW	2 - 5	6 - 10	1 - 12	Silt, Sand, Cobble	Moderate	Clear	SKK	1,371	Perennial	Yes	Subject
SLL	UT to Sycamore Creek	27-33-9	B NSW	1 - 2	1 - 3	1 - 6	Sand, Cobble	Slow	Clear	SLL	380	Perennial	Yes	Subject
SMM	UT to Sycamore Creek	27-33-9	B NSW	0.5 - 1	2 - 3	0.5 - 6	Silt, Sand, Gravel	Moderate	Slightly turbid	SMM	318	Intermittent	Undetermined	Subject
SNN	UT to Sycamore Creek	27-33-9	B NSW	1 - 3	2 - 5	2 - 16	Silt, Sand, Gravel, Rip Rap	Slow	Turbid	SNN	96	Perennial	Yes	Subject

Map ID	Stream Name	NCDWR Index Number	Best Usage Classification	Bank Height (ft.)	Channel Width (ft.)	Water Depth (in.)	Channel Substrate	Flow	Clarity	Map ID	Total Length in Entire Study Area (ft.)	Classification	USACE Compensatory Mitigation Required	River Basin Buffer
SOO	UT to Little Brier Creek	27-33-4-1	C NSW	0.25 - 0.83	1 - 2	0.5 - 3	Sand, Gravel	Moderate	Clear	SOO	324	Intermittent	Undetermined	Subject
SOO	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 5	6	1 - 8	Sand, Gravel, Cobble	Slow	Slightly turbid	SOO	797	Perennial	Yes	
SPP	UT to Little Brier Creek	27-33-4-1	C NSW	0.25 - 1	1 - 2	0.5 - 3	Sand, Gravel	Moderate	Clear to Slightly Turbid	SPP	199	Intermittent	Undetermined	Subject
SQQ	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 7	1 - 15	1 - 24	Silt, Sand, Gravel, Bedrock	Slow	Clear	SQQ	6,741	Perennial	Yes	Subject
SRR	UT to Little Brier Creek	27-33-4-1	C NSW	4 - 5	4 - 6	1 - 5	Silt, Sand, Gravel, Rip Rap	Slow	Turbid	SRR	310	Perennial	Yes	Subject
SSS	UT to Little Brier Creek	27-33-4-1	C NSW	0.1 - 2	3	0.5 - 2	Silt, Sand	Slow	Clear	SSS	25	Intermittent	Undetermined	Not Subject
STT	UT to Little Brier Creek	27-33-4-1	C NSW	0.25 - 0.33	1 - 3	0.5 - 1	Silt, Sand	Moderate	Clear	STT	522	Intermittent	Undetermined	Subject
STT	UT to Little Brier Creek	27-33-4-1	C NSW	2 - 4	3 - 4	1 - 3	Silt, Sand	Slow	Clear	STT	1,568	Perennial	Yes	
SUU	UT to Little Brier Creek	27-33-4-1	C NSW	2 - 3	3 - 6	0.5 - 2	Sand, Gravel	Moderate	Clear	SUU	125	Intermittent	Undetermined	Not Subject
SVV	UT to Little Brier Creek	27-33-4-1	C NSW	0.17 - 0.33	1 - 3	0.25 - 2	Silt, Sand, Gravel, Rip Rap	Moderate	Clear	SVV	79	Intermittent	Undetermined	Not Subject
SWW	UT to Little Brier Creek	27-33-4-1	C NSW	0.5 - 3	1 - 2	0.5 - 2	Silt, Sand, Gravel, Bedrock	Moderate	Clear	SWW	730	Intermittent	Undetermined	Subject
SXX	UT to Little Brier Creek	27-33-4-1	C NSW	0.25 - 1	0.67 - 4	0.5 - 6	Silt, Sand, Gravel, Bedrock	Slow	Clear	SXX	1,150	Intermittent	Undetermined	Subject
SYY	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 2	2 - 4	1 -	Loamy Sand	Moderate	Clear	SYY	944	Intermittent	Undetermined	Subject
SZZ	UT to Lick Creek	27-11-(0.5)	WS-IV NSW	1 - 4	2 - 6	1 - 10	Silt, Sand, Gravel, Cobble, Bedrock	Slow	Clear	SZZ	508	Perennial	Yes	Subject
SZZA	UT to Lick Creek	27-11-(0.5)	WS-IV NSW	0.5 - 6	1 - 2	0.5 - 6	Silt, Sand, Gravel, Cobble, Rip Rap, Bedrock	Moderate	Clear	SZZA	146	Intermittent	Undetermined	Subject
SZZB	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 3	1 - 2	0.5 - 4	Silt, Sand, Gravel	Slow	Clear	SZZB	532	Intermittent	Undetermined	Not Subject
SZZC	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 5	3 - 6	0.25 - 2	Sand, Gravel	Slow to Moderate	Clear	SZZC	35	Intermittent	Undetermined	Subject
SZZC	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 6	1 - 10	1 - 10	Silt, Sand, Gravel, Bedrock	Slow	Clear	SZZC	1,574	Perennial	Yes	
SZZD	UT to Little Brier Creek	27-33-4-1	C NSW	0.5 - 3	1 - 3	0.5 - 6	Silt, Sand, Gravel, Bedrock	Moderate	Clear	SZZD	492	Intermittent	Undetermined	Subject
SZZE	UT to Little Brier Creek	27-33-4-1	C NSW	0.5 - 3	3 - 4	1 - 5	Silt, Sand, Gravel	Moderate	Clear	SZZE	435	Intermittent	Undetermined	Subject
SZZF	UT to Little Brier Creek	27-33-4-1	C NSW	0.25 - 3	2 - 3	0.25 - 4	Silt, Sand, Gravel	Moderate	Clear	SZZF	453	Intermittent	Undetermined	Not Subject
SZZG	UT to Little Brier Creek	27-33-4-1	C NSW	0.17 - 2	1 - 4	0.25 - 5	Silt, Sand, Gravel, Rip Rap	Moderate	Clear	SZZG	2,152	Perennial	Yes	Subject
SZZG	UT to Little Brier Creek	27-33-4-1	C NSW	0.5	1 - 3	1 - 12	Clay, Sand, Rip Rap	Slow	Clear to Slightly Turbid					
SZZH	UT to Little Brier Creek	27-33-4-1	C NSW	0.5 - 3	3 - 10	1 - 12	Silt, Sand, Gravel, Boulder	Slow to Moderate	Clear	SZZH	277	Intermittent	Undetermined	Subject
SZZI	UT to Little Brier Creek	27-33-4-1	C NSW	0.1 - 4	1 - 5	0.5 - 4	Silt, Sand, Gravel, Rip Rap	Slow	Clear	SZZI	559	Intermittent	Undetermined	Subject
										SZZI	65	Perennial	Yes	
SZZK	UT to Little Brier Creek	27-33-4-1	C NSW	1	1 - 1.5	0.5 - 1	Silt, Sand	Moderate	Slightly turbid	SZZK	113	Intermittent	Undetermined	Not Subject
SZZL	UT to Little Brier Creek	27-33-4-1	C NSW	2 - 4	3 - 5	2 - 10	Silt, Sand, Gravel, Rip Rap	Slow	Slightly turbid	SZZL	100	Intermittent	Undetermined	Not Subject
SZZM	UT to Little Brier Creek	27-33-4-1	C NSW	0.33 - 2	1 - 2	1 - 4	Silt, Sand	Moderate	Clear	SZZM	478	Intermittent	Undetermined	Not Subject

Map ID	Stream Name	NCDWR Index Number	Best Usage Classification	Bank Height (ft.)	Channel Width (ft.)	Water Depth (in.)	Channel Substrate	Flow	Clarity	Map ID	Total Length in Entire Study Area (ft.)	Classification	USACE Compensatory Mitigation Required	River Basin Buffer
SZZN	UT to Little Brier Creek	27-33-4-1	C NSW	3 - 6	3 - 5	2 - 6	Silt, Sand, Gravel, Cobble	Moderate	Slightly turbid	SZZN	291	Perennial	Yes	Subject
SJJ				1 - 5	3 - 6	3 - 12	Silt, Sand, Gravel, Rip Rap	Slow	Clear					
SZZO	UT to Little Brier Creek	27-33-4-1	C NSW	2 - 3	1 - 4	0.5 - 8	Silt, Sand, Gravel	Moderate	Clear	SZZO	170	Intermittent	Undetermined	Not Subject
SZZP	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 2	1 - 4	1 - 6	Silt, Sand, Gravel, Cobble, Bedrock	Moderate	Clear	SZZP	655	Intermittent	Undetermined	Subject
SZZQ	UT to Little Brier Creek	27-33-4-1	C NSW	1 - 4	2	1	Silt, Sand, Gravel	Moderate	Clear	SZZQ	117	Intermittent	Undetermined	Not Subject
SZZR	UT to Little Brier Creek	27-33-4-1	C NSW	0.5 - 6	3 - 6	1 - 18	Silt, Sand, Gravel, Cobble, Rip Rap, Bedrock	Moderate	Clear	SZZR	401	Perennial	Yes	Subject
SZZS	UT to Little Brier Creek	27-33-4-1	C NSW	2 - 3	2 - 6	0.5 - 1.5	Silt, Sand, Gravel	Slow	Slightly turbid	SZZS	111	Intermittent	Undetermined	Not Subject
SZZT	UT to Little Brier Creek	27-33-4-1	C NSW	2	2	0.5 - 2	Silt, Sand, Gravel	Moderate	Clear	SZZT	10	Perennial	Yes	Subject

Table 8: Characteristics of jurisdictional wetlands

Map ID	NCWAM Classification	Hydrologic Classification	Area (acres)
WA	NTFM	Riparian	4.43
WB	FP	Riparian	0.01
WC	HF	Riparian	0.04
WL	BFH	Riparian	0.49
WO	FP	Riparian	0.02
WP	HF	Riparian	0.31
WR	NTFM	Riparian	0.03
WR-1	NTFM	Riparian	0.02
WR-2	NTFM	Riparian	0.01
WV	HF	Riparian	0.25
WX	NTFM/BHF	Riparian	0.96
WY	HF	Riparian	0.42
WZ	FP/BHF	Riparian	0.32
WAA	HF	Riparian	0.04
WBB	HF	Riparian	0.01
WCC	HF	Riparian	0.83
WFF	HF	Riparian	0.12
WII	HF	Riparian	0.27
WJJ	BHF	Riparian	0.08
WNN	NTFM	Riparian	0.01
WOO	NTFM	Riparian	0.91
WUU	HF	Riparian	0.14
WVV	HF	Riparian	0.28
WWW	NTFM	Non-riparian	0.07
WYY	HF	Riparian	0.02
WZZ	BHF	Riparian	1.71
WA-1	HF/BHF	Riparian	0.23
WE-1	BHF	Riparian	1.25
WZZA	NTFM/BHF	Riparian	0.19
WZZB	NTFM/BHF	Riparian	0.13
WZZC	BHF	Riparian	0.11
WZZD	NTFM	Riparian	0.01
WZZE	NTFM	Riparian	0.02
WZZF	HF	Riparian	0.07
WZZG	HF	Riparian	0.13
WZZH	HF	Riparian	0.01
WZZI	HF	Riparian	0.01
WZZJ	NTFM/BHF	Riparian	2.36
WZZK	NTFM	Riparian	0.09
WZZL	HF	Riparian	0.02

Map ID	NCWAM Classification	Hydrologic Classification	Area (acres)
WZZM	HF	Riparian	0.08
WZZN	HF	Riparian	0.02
WZZO	HF	Riparian	0.01
WZZP	HF	Riparian	0.17
WZZQ	FP/HF	Riparian	0.03
WZZR	FP	Riparian	0.02
WZZS	HF	Riparian	0.16
WZZT	HF	Riparian	0.06
WZZU	BW	Non-riparian	0.08
WZZV	NTFM/HF	Riparian	0.67
WZZW	HF	Riparian	0.17
WZZX	NTFM/HF	Riparian	0.27
WZZY	HF	Riparian	0.01
WZZZ	HF	Riparian	0.05
WZZZA	NTFM	Riparian	0.08

9. Hydraulic Structures

Fifteen major hydraulic crossings were identified in the 2018 Hydraulic Aspects Report. Of the 15, eight hydraulic crossings already exist. Seven new crossings were identified based on the three alternatives. Alternative 1 has three new crossings. Alternative 2 has three different new crossings. Alternative 2 Revised has a total of four new crossings: the same three new crossings as Alternative 2 and one additional new crossing. These structures are described in **Table 9** and shown in **Appendix B**.

Table 9: Summary table of hydraulic recommendations

Site Number	Alternative	Stream ID	Stream Name	Existing Structure	Proposed Structure	Stream Impact (feet)
1	1, 2, 2-Revised	SJ	Little Brier Creek (Basin 18, Stream 15)	2 @ 7'x10' RCBC Existing = 126'	Retain & Extend: 2 @ 7'x10' RCBC Extend 64' upstream & 57' downstream	Alt 1: 810 Alt 2: 1,108 Alt 2 Revised: 1,092
2	1	SJ	Little Brier Creek (Basin 18, Stream 15)	N/A	2 @ 9'x8' RCBC	810
3	1, 2, 2-Revised	SJ	Little Brier Creek (Basin 18, Stream 15)	2 @ 9'x8' RCBC Existing = 209'	Retain & Extend: 2 @ 9'x8' RCBC Extend 13' downstream	Alt 1: 810 Alt 2: 1,108 Alt 2 Revised: 1,092
4	1, 2-Revised	SJ	Little Brier Creek (Basin 18, Stream 15)	2 @ 14'x9.3' RCB Arc Existing = 125'	Retain & Extend: 2 @ 14'x9.3' RCB Arch Extend 32' upstream & 24' downstream	Alt 1: 810 Alt 2-Revised: 1,108
5	1	SC	UT to Little Brier Creek	N/A	9' x 8' RCBC Buried 1-foot	447
6	1, 2, 2-Revised	SC	UT to Little Brier Creek	7' x 6' RCBC	Alt 1 - 9' x 8' RCBC Buried 1-foot Alt 2 - 8' x 8' RCBC Buried 1-foot	Alt 1: 447 Alt 2: 321 Alt 2 Revised: 266
7	1	ST	UT to Little Brier Creek	N/A	9' x 8' RCBC Buried 1-foot	285
8	1, 2, 2-Revised	SC	UT to Little Brier Creek	6'x6' RCBC Existing = 75'	Retain Existing: 6'x6' RCBC	Alt 1: 447 Alt 2: 321 Alt 2 Revised: 266
9	1, 2, 2-Revised	SW	Little Brier Creek East (Basin 18, Stream 16)	2 @ 8'x7' RCBC Existing = 275'	Retain & Extend: 2 @ 8'x7' RCBC Extend 62' upstream & 72' downstream	Alt 1: 173 Alt 2: 243 Alt 2 Revised: 173
10	1, 2-Revised	SZZJ/SN	UT to Little Brier Creek	78" CMP (U/S); 84" CMP (D/S)	7' x 7' RCBC Buried 1-foot	Alt 1: 1,190 Alt 2-Revised: 288
11	2, 2-Revised	SQQ	UT to Little Brier Creek	N/A	7' x 7' RCBC Buried 1-foot	Alt 2: 3,120 Alt 2 Revised: 2,969

Site Number	Alternative	Stream ID	Stream Name	Existing Structure	Proposed Structure	Stream Impact (feet)
12	2, 2-Revised	SQQ	UT to Little Brier Creek	N/A	7' x 8' RCBC Buried 1-foot	Alt 2: 3,120 Alt 2 Revised: 2,969
13	2, 2-Revised	SQQ	UT to Little Brier Creek	N/A	8' x 8' RCBC Buried 1-foot	Alt 2: 3,120 Alt 2 Revised: 2,969
14	2, 2-Revised	SZZG	UT to Little Brier Creek	2 @ 54" RCP Existing = 217'	Retain & Extend: 2 @ 54" RCP Extend 114' upstream	Alt 2: 329 Alt 2 Revised: 222
15	2-Revised	SJ	Little Brier Creek (Basin 18, Stream 15)	N/A	2 @ 9'x9' RCBC	1092

10. Summary of Alternative Impacts

A comparison of the impacts for the three alternatives is shown in **Table 10**.

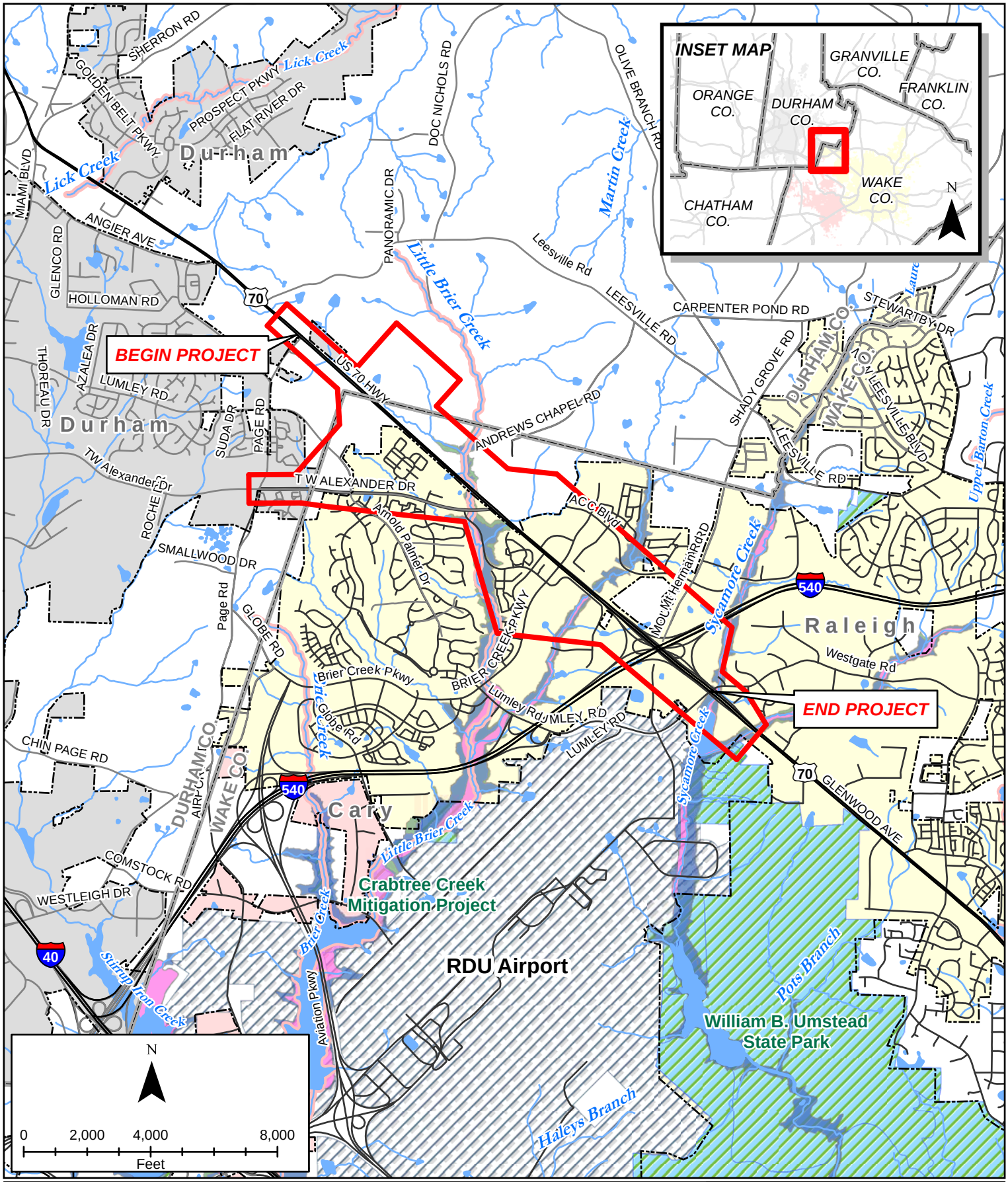
Table 10: Comparison of build alternatives

Resource	Category	Alternative 1	Alternative 2	Alternative 2 Rev
Length along US 70 (miles)		2.5	2.5	2.5
Archaeological Sites		Waiting on a preferred alternative		
Historic Properties		0	0	0
Jurisdictional Impacts				
Floodplains	Floodway (acres)	2.5	1.8	3.6
Floodplains	100-year Floodplain (excluding floodway) (acres)	2.7	2.1	4.0
Streams	Number of Crossings	17	16	19
Stream	Linear Feet	6,267.9	7,659.0	8,948.9
Wetland	Number of Crossings	6	9	11
Wetland	Acres	2.8	3.6	2.7
Pond	Number of Crossings	1	1	2
Pond	Acres	0.015	0.002	0.005
Land Use Impacts				
Durham Zoning	Commercial (acres)	7.0	9.1	11.0
Durham Zoning	Industrial (acres)	14.3	15.3	16.7
Durham Zoning	Single Family Residential	2.1	13.5	14.6
Durham Zoning	Office (acres)	6.0	10.6	10.6
Raleigh Zoning	Commercial Mixed Use	74.0	65.5	70.4
Raleigh Zoning	Neighborhood Mixed Use	0.4	0.0	0.2
Raleigh Zoning	Office Mixed Use	3.5	22.4	22.4
Raleigh Zoning	Planned Development	5.0	4.3	5.5
Raleigh Zoning	Single Family Residential	21.2	33.9	36.9
Raleigh Zoning	Residential Mixed Use	14.4	17.3	18.8
Community Facilities				
Hazmat Sites		1	1	1
Schools		0	0	0
Churches		0	3	3
Cemeteries		0	0	0
Parks		0	0	0

11. Conclusion

The Merger Team is being asked for concurrence to add Alternative 2 Revised as a Detailed Study Alternative (CP 2 Revisited) and on the hydraulic recommendations described in **Table 9** at the locations shown in Appendix B (CP 2A). Draft Concurrence forms are shown in **Appendix C**.

Appendix A: Figures



LEGEND

- Project Study Area
- Cary City Limits
- Durham City Limits
- Raleigh City Limits
- Managed Conservation Land
- RDU Airport
- 303(d) Listed Streams
- County Boundary
- Floodway
- 100-Year floodplain
- 500-Year floodplain

Vicinity Map

US 70 (Glenwood Ave.) from west of SR 3067 (T.W. Alexander Dr.) to I-540
Raleigh, North Carolina

TIP Project U-5518

February 2016

FIGURE 1

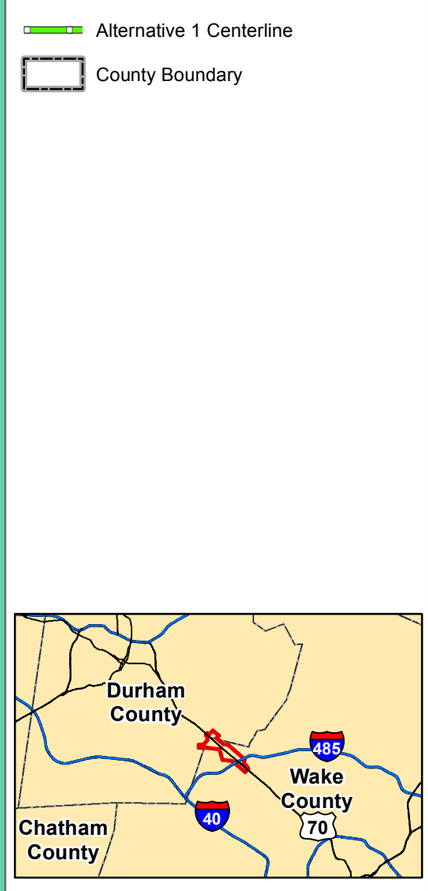
Brier Creek Improvements

State Transportation Improvement Program
Project No. U-5518
Concurrence Point 2A

Figure 2-1 Alternative 1

Legend

- Alternative 1 Centerline
- County Boundary



0 500 1,000 1,500 2,000 Feet

N

Date: May 2018
This map is for reference only.
Sources: ESRI, CGIA, NCDOT, and AECOM

Brier Creek Improvements

State Transportation Improvement Program
Project No. U-5518
Concurrence Point 2A

Figure 2-2 Alternative 2

Legend

- Alternative 2 Centerline
- County Boundary

0 500 1,000 1,500 2,000 Feet

N

Date: May 2018
This map is for reference only.
Sources: ESRI, CGIA, NCDOT, and AECOM

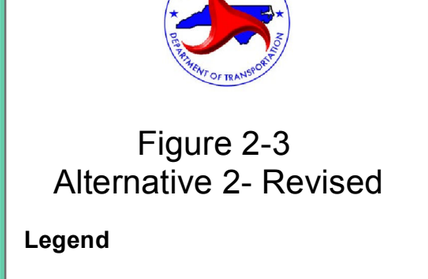
Brier Creek Improvements

State Transportation Improvement Program
Project No. U-5518
Concurrence Point 2A

Figure 2-3
Alternative 2- Revised

Legend

- Alternative 2- Revised Centerline
- County Boundary



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N

Date: May 2018
This map is for reference only.
Sources: ESRI, CGIA, NCDOT, and AECOM

US 70, West of T.W. Alexander Drive to East of I-540

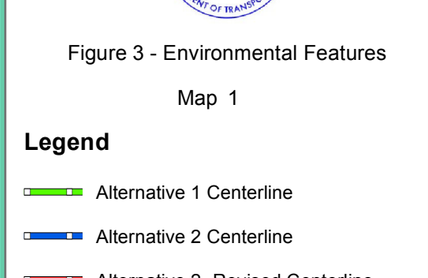
State Transportation Improvement Program
Project No. U-5518
Concurrence Point 2A

Figure 3 - Environmental Features

Map 1

Legend

- Alternative 1 Centerline
- Alternative 2 Centerline
- Alternative 2- Revised Centerline
- Delineated Streams
- Delineated Wetland
- Delineated Ponds
- Slope Stake Limits
- ROW Limits
- County Boundary



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Date: May 2018
This map is for reference only.
Sources: ESRI, CGIA, NCDOT, and AECOM

US 70, West of T.W. Alexander Drive to East of I-540

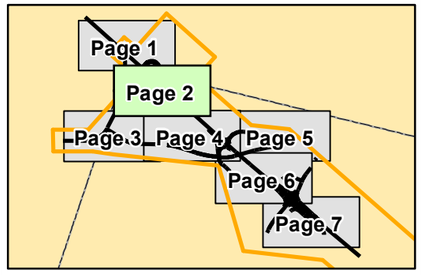
State Transportation Improvement Program
Project No. U-5518
Concurrence Point 2A

Figure 3 - Environmental Features

Map 2

Legend

- Alternative 1 Centerline
- Alternative 2 Centerline
- Alternative 2- Revised Centerline
- Church
- Day Care
- Cemetery
- Delineated Streams
- Delineated Wetland
- Delineated Ponds
- 100-year floodplain
- Slope Stake Limits
- ROW Limits
- County Boundary



0 125 250 375 500 Feet

N

Date: May 2018
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NC Center for Geographic Information & Analysis

US 70, West of T.W. Alexander Drive to East of I-540

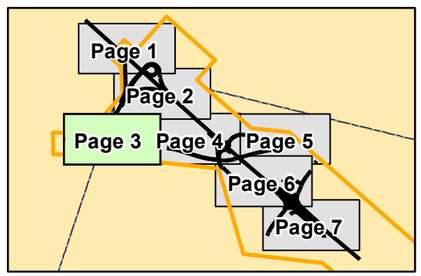
State Transportation Improvement Program
Project No. U-5518
Concurrence Point 2A

Figure 3 - Environmental Features

Map 3

Legend

- Alternative 1 Centerline
- Alternative 2 Centerline
- Alternative 2- Revised Centerline
- Church
- Day Care
- Cemetery
- Delineated Streams
- Delineated Wetland
- Delineated Ponds
- Slope Stake Limits
- ROW Limits
- County Boundary



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N

Date: May 2018
This map is for reference only.
Sources: ESRI, CGIA, NCDOT, and AECOM

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US 70, West of T.W. Alexander Drive to East of I-540

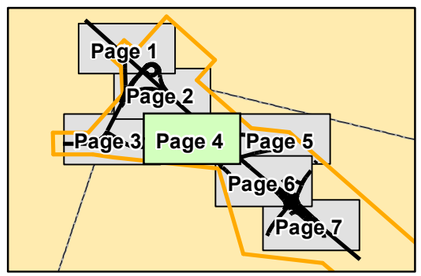
State Transportation Improvement Program
Project No. U-5518
Concurrence Point 2A

Figure 3 - Environmental Features

Map 4

Legend

- Alternative 1 Centerline
- Alternative 2 Centerline
- Alternative 2- Revised Centerline
- Church
- Day Care
- Delineated Streams
- Delineated Wetland
- Delineated Ponds
- 100-year floodplain
- Floodway
- Slope Stake Limits
- ROW Limits
- County Boundary



0 125 250 375 500 Feet

N

Date: May 2018
This map is for reference only.
Sources: ESRI, CGIA, NCDOT, and AECOM

US 70, West of T.W. Alexander Drive to East of I-540

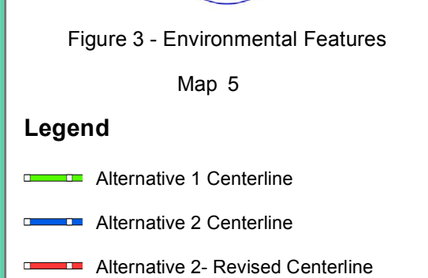
State Transportation Improvement Program
Project No. U-5518
Concurrence Point 2A

Figure 3 - Environmental Features

Map 5

Legend

- Alternative 1 Centerline
- Alternative 2 Centerline
- Alternative 2- Revised Centerline
- Church
- Day Care
- Delineated Streams
- Delineated Wetland
- Delineated Ponds
- 100-year floodplain
- Slope Stake Limits
- ROW Limits
- County Boundary



0 125 250 375 500 Feet

N

Date: May 2018
This map is for reference only.
Sources: ESRI, CGIA, NCDOT, and AECOM

NC Center for Geographic Information & Analysis

US 70, West of T.W. Alexander Drive to East of I-540

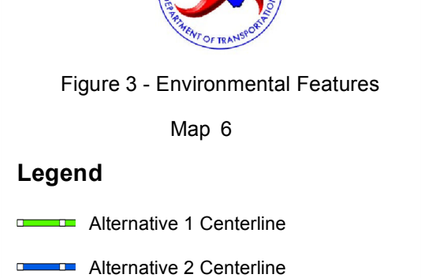
State Transportation Improvement Program
Project No. U-5518
Concurrence Point 2A

Figure 3 - Environmental Features

Map 6

Legend

- Alternative 1 Centerline
- Alternative 2 Centerline
- Alternative 2- Revised Centerline
- Church
- Day Care
- Delineated Streams
- Delineated Wetland
- Delineated Ponds
- 100-year floodplain
- Floodway
- Slope Stake Limits
- ROW Limits
- County Boundary



0 125 250 375 500 Feet

N

Date: May 2018
This map is for reference only.
Sources: ESRI, CGIA, NCDOT, and AECOM

NC Center for Geographic Information & Analysis

US 70, West of T.W. Alexander Drive to East of I-540

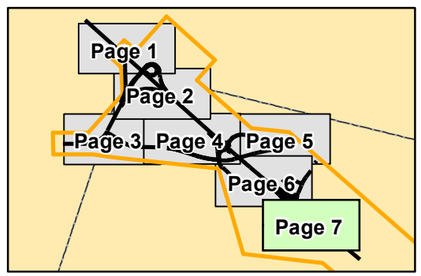
State Transportation Improvement Program
Project No. U-5518
Concurrence Point 2A

Figure 3 - Environmental Features

Map 7

Legend

- Alternative 1 Centerline
- Alternative 2 Centerline
- Alternative 2- Revised Centerline
- Cemetery
- Delineated Streams
- Delineated Wetland
- Delineated Ponds
- 100-year floodplain
- Floodway
- Slope Stake Limits
- ROW Limits
- County Boundary



0 125 250 375 500 Feet

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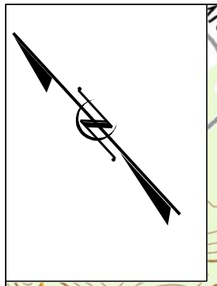
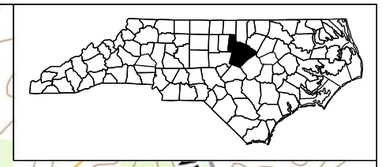
Date: May 2018
This map is for reference only.
Sources: ESRI, CGIA, NCDOT, and AECOM

Appendix B: Hydraulic Crossing Locations





CROSSING 1

CROSSING 2

CROSSING 3

CROSSING 4

CROSSING 5

CROSSING 6

CROSSING 7

CROSSING 8

CROSSING 9

CROSSING 10

-L-

-RP1A-

-RP1B-

-RP1C-

-RP1D-

-RP2B-

-RP2C-

-Y01A-

-Y04-

-Y08-

-Y09-

-SER1-

GLENWOOD AVE

ACC BLVD

LITTLE BRIER CREEK LN

PALM BAY CIR

SOUTHERN PKWY

ARNOLD PALMER DR

ROUND BROOK CIR

WINGED THISTLE CT

EMPIRE LAKES DR

CLUBVALLEY WAY

LUMLEY RD

BRIER CREEK PKWY

ARCO CORPORATE DR

WIND RIVER PKWY

SUDA DR

FELLOWSHIP DR

PAGE RD

PAGE RD EXD

LEESVILLE RD

ADVENTURE TRL

ANDREWS CHA

MOUNT HERMA

Little Brier Cr

Lake Shore

Lower Springdale Estates Lake

Restlawn Memorial Gardens

Pet Rest Memorial Park

RALEIGH

TO DURHAM

TO RALEIGH

TO I-40

TO I-40

400

350

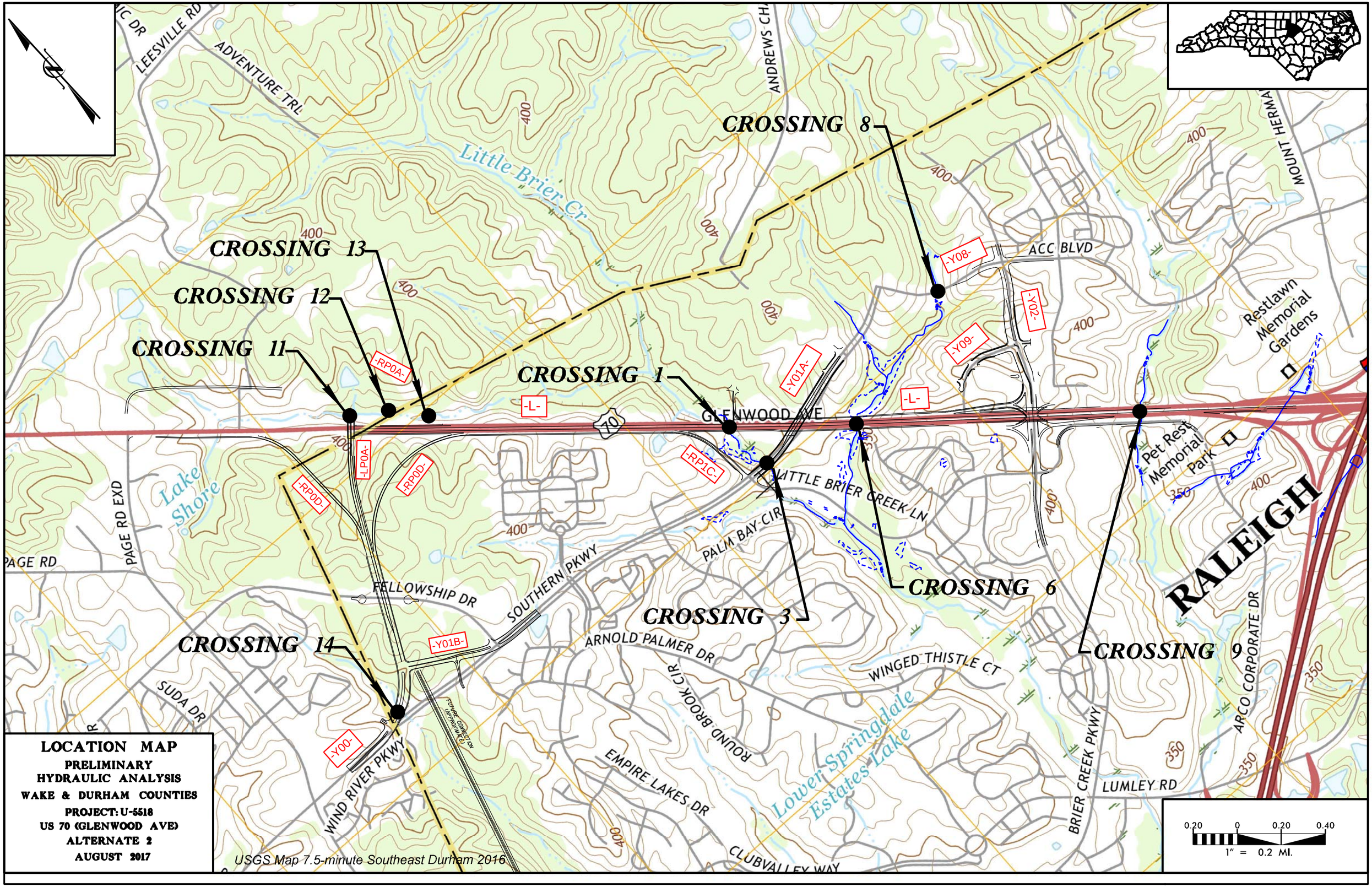
LOCATION MAP

PRELIMINARY
HYDRAULIC ANALYSIS
WAKE & DURHAM COUNTIES
PROJECT: U-5518
US 70 (GLENWOOD AVE)
ALTERNATE 1
AUGUST 2017

USGS Map 7.5-minute Southeast Durham 2016

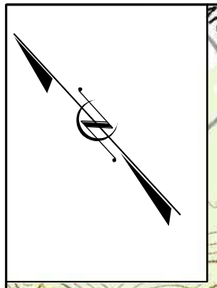
0.20 0 0.20 0.40

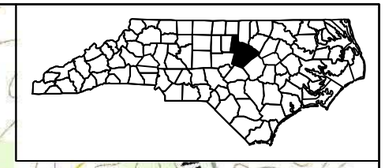
1" = 0.2 MI.



LOCATION MAP
PRELIMINARY
HYDRAULIC ANALYSIS
WAKE & DURHAM COUNTIES
PROJECT: U-5518
US 70 (GLENWOOD AVE)
ALTERNATE 2
AUGUST 2017

USGS Map 7.5-minute Southeast Durham 2016





CROSSING 8

CROSSING 13

CROSSING 12

CROSSING 11

CROSSING 1

CROSSING 15

CROSSING 6

CROSSING 3

CROSSING 14

CROSSING 9

LEESVILLE RD

ADVENTURE TRL

ANDREWS CHA

MOUNT HERMA

Little Brier Cr

ACC BLVD

Restlawn Memorial Gardens

Pet Rest Memorial Park

GLENWOOD AVE

US 70

LITTLE BRIER CREEK LN

PALM BAY CIR

RALEIGH

PAGE RD EXD

PAGE RD

Lake Shore

FELLOWSHIP DR

SOUTHERN PKWY

ARNOLD PALMER DR

ROUND BROOK CIR

WINGED THISTLE CT

ARCO CORPORATE DR

SUDA DR

WIND RIVER PKWY

EMPIRE LAKES DR

Lower Springdale Estates Lake

BRIER CREEK PKWY

LUMLEY RD

CLUBVALLEY WAY

400

350

LOCATION MAP
PRELIMINARY
HYDRAULIC ANALYSIS
WAKE & DURHAM COUNTIES
PROJECT: U-5518
US 70 (GLENWOOD AVE)
ALTERNATE 2-REVISED
APRIL 2018

USGS Map 7.5-minute Southeast Durham 2016

0.20 0 0.20 0.40
1" = 0.2 MI.

Appendix C: Draft CP2 and CP2A Agreements

Section 404 / NEPA Interagency Merger Process Concurrence Agreement
Concurrence Point No. 2 – Detailed Study Alternatives Carried Forward

US 70, West of T.W. Alexander Drive to East of I-540
NCDOT Division 5 – Wake & Durham County
NCDOT STIP Project No. U-5518

Alternatives to Study in Detail:

No-Build Alternative

Alternative 1

Alternative 2

Alternative 2 Revised

The project team has concurred on this date of May 25, 2018 with the alternatives to be carried forward for the proposed project as indicated above and shown on the attached figures. This form supersedes the Concurrence Point 2 form signed on March 10, 2016.

USACE	Eric Alsmeyer	NCDOT	Zahid Baloch
USEPA	Chris Militscher	USFWS	Gary Jordan
FHWA	Felix Davila	NCWRC	Travis Wilson
NCHPO	Renee Gledhill-Earley	NCDWR	Rob Ridings
DCHC MPO	Felix Nwoko	CAMPO	Chris Lukasina

Section 404 / NEPA Interagency Merger Process Concurrence Agreement
Concurrence Point No. 2A – Bridging Decisions and Alignment Review

US 70, West of T.W. Alexander Drive to East of I-540
NCDOT Division 5 – Wake & Durham County
NCDOT STIP Project No. U-5518

Hydraulic structures of at least the length or size indicated below will be provided for the project. The site numbers refer to the locations shown in Appendix B of the Merger Packet. Revisiting CP2A decisions may occur if needed during the normal CP4A Avoidance and Minimization Merger Team Meeting.

Summary Table of Hydraulic Recommendations

Site No.	Alternative	Stream ID	Stream Name	Existing Structure	Proposed Structure	Stream Impact (feet)
1	1, 2, 2-Revised	SJ	Little Brier Creek (Basin 18, Stream 15)	2 @ 7'x10' RCBC	Retain & Extend: 2 @ 7' x10' RCBC Extend 64' upstream & 57' downstream	Alt 1: 810 Alt 2: 1,108 Alt 2 Revised: 1,092
2	1	SJ	Little Brier Creek (Basin 18, Stream 15)	N/A	2 @ 9'x8' RCBC	810
3	1, 2, 2-Revised	SJ	Little Brier Creek (Basin 18, Stream 15)	2 @ 9'x8' RCBC	Retain & Extend: 2 @ 9' x8' RCBC Extend 13' downstream	Alt 1: 810 Alt 2: 1,108 Alt 2 Revised: 1,092
4	1, 2-Revised	SJ	Little Brier Creek (Basin 18, Stream 15)	2 @ 14' x 9.3' RCB Arch	Retain & Extend: 2 @ 14'x9.3' RCB Arch Extend 32' upstream & 24' downstream	Alt 1: 810 Alt 2: 1,108
5	1	SC	UT to Little Brier Creek	N/A	9' x 8' RCBC Buried 1-foot	447
6	1, 2, 2-Revised	SC	UT to Little Brier Creek	7' x 6' RCBC	Alt 1 - 9' x 8' RCBC Buried 1-foot Alt 2 - 8' x 8' RCBC Buried 1-foot	Alt 1: 447 Alt 2: 321 Alt 2 Revised: 266
7	1	ST	UT to Little Brier Creek	N/A	9' x 8' RCBC Buried 1-foot	285
8	1, 2, 2-Revised	SC	UT to Little Brier Creek	6' x 6' RCBC	Retain Existing: 6'x6' RC BC	Alt 1: 447 Alt 2: 321 Alt 2 Revised: 266
9	1, 2, 2-Revised	SW	Little Brier Creek East (Basin 18, Stream 16)	2 @ 8' x 7' RCBC	Retain & Extend: 2 @ 8' x7' RCBC Extend 62' upstream & 72' downstream	Alt 1: 173 Alt 2: 243 Alt 2 Revised: 173
10	1, 2-Revised	SZZJ/SN	UT to Little Brier Creek	78" CMP (U/S); 84" CMP (D/S)	7' x 7' RCBC Buried 1-foot	Alt 1: 1,190 Alt 2: 288

Site No.	Alternative	Stream ID	Stream Name	Existing Structure	Proposed Structure	Stream Impact (feet)
11	2, 2-Revised	SQQ	UT to Little Brier Creek	N/A	7' x 7' RCBC Buried 1-foot	Alt 2: 3,120 Alt 2 Revised: 2,969
12	2, 2-Revised	SQQ	UT to Little Brier Creek	N/A	7' x 8' RCBC Buried 1-foot	Alt 2: 3,120 Alt 2 Revised: 2,969
13	2, 2-Revised	SQQ	UT to Little Brier Creek	N/A	8' x 8' RCBC Buried 1-foot	Alt 2: 3,120 Alt 2 Revised: 2,969
14	2, 2-Revised	SZZG	UT to Little Brier Creek	2 @ 54" RCP	Retain & Extend: 2 @ 5 4" RCP Extend 114' upstream	Alt 2: 329 Alt 2 Revised: 222
15	2-Revised	SJ	Little Brier Creek (Basin 18, Stream 15)	N/A	2 @ 9'x9' RCBC	1092

The Project Team has concurred on this date of May 25, 2018 with the Bridging Decisions and Alignment Review for the proposed project as stated above.

USACE _____ Eric Alsmeyer

NCDOT _____ Zahid Baloch

USEPA _____ Chris Militscher

USFWS _____ Gary Jordan

FHWA _____ Felix Davila

NCWRC _____ Travis Wilson

NCHPO _____ Renee Gledhill-Earley

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